

## **REMARKS**

### **General:**

Claims 1-6 and 13-18 are pending in this application. Claims 7-12 stand withdrawn from consideration.

In issuing the rejections in the office action, the Examiner explicitly stated that the process steps recited in the claims were given no weight. As discussed below, this may be a proper first step for the Examiner to take when reviewing process by product claims. However, when evidence is provided by the Applicant that the process steps produce a structural affect on the product, the Examiner *must* take that into account in determining patentability.

In addressing the current office action, Applicant starts by commenting on the current rejections. Evidence supporting the structural differences in the claimed product are provided after the review of the current rejections.

An interview was held with Examiner Ghassem Alie and SPE Allan Shoap on April 29, 2004 during which the present rejections were discussed. Applicant thanks Examiners Alie and Shoap for their time and courtesy. The test data was shown which supported Applicant's position regarding the reduction in the tensile residual stress in the part (i.e., reduction in embrittlement). The Examiners pointed out that amending the claims to recite that the resulting blade had reduced surface tensile residual stress would overcome the prior art. Applicant has amended the independent claims to specifically recite this feature. Support for this can be found in the specification, including page 10. If the Examiner prefers, Applicant would be amendable to adding the test data charts shown in Exhibit C.

### **Current Rejections are Traversed**

#### **35 U.S.C. § 102:**

Claims 1, 2, 6, 13, 14, and 18 stand rejected as anticipated by U.S. Patent No. 5,802,932 (Vankov et al.). Vankov shows a cutter for an electric shaver. The cutter is made from material with a surface roughness Ra of less than 1  $\mu\text{m}$  (0.04 microinches), which becomes the final finish on one side. The other side is electropolished to a roughness Ra of less than 5  $\mu\text{m}$ , preferably about 0.5  $\mu\text{m}$  (0.02 microinches).

Claim 1 defines a saw blade in which the finish is a finish with reduced embrittlement obtainable by a process of rotating the saw blade with abrasive finishing media in an inner vessel of a high speed centrifugal finishing apparatus having an outer vessel and at least one inner vessel that rotates at high speed relative to the outer vessel. As a starting point, there is no disclosure or suggestion in Vankov of such a finish. Vankov discloses only an electropolishing process that would not affect the mechanical properties of the blade and, in particular, could not produce the reduced embrittlement achieved by the process of the present invention as claimed. As will be discussed in more detail below, saw blades have been tested that were processed in accordance with the electro polishing process described in Vankov and the claimed finishing process. The results support the arguments presented in the prior response and in the application - that the application of the process recited in the claims produces a structural change to the saw blade resulting in different structural characteristics. Thus, the present claims are not anticipated by Vankov.

An electropolishing process operates by the removal of material from a surface, i.e., taking away the high points on the metal surface. Thus, the material characteristics of the metal itself does not change. It just becomes less course. See, Electropolishing - A User's Guide to Applications, Quality Standards and Specifications, Delstar Metal Finishing, Inc., 2003

The claims, however, recite a product that is structurally different. The surface is cold plastically deformed. That is, abrasive particles are rotated at high speeds and energy causing the surface layer of the materials to be uniformly deformed. As described in the application, the process produces a product that is structurally different. The surface of the product is impacted so as to be compressed into a highly polished surface with reduced embrittlement compared to the unfinished state.

The reduced embrittlement is a distinct property of the saw blade, and is an outward sign of differences in the metallurgical structure of the blade, caused by the centrifugal finishing process. There is no disclosure or suggestion of that different structure in Vankov's blade, and it is therefore believed that the present invention, as now claimed in claims 1 and 13, is both new and non-obvious over Vankov.

As discussed below, the product-by-process formulation is proper under MPEP § 2113 because the surface finish, which combines high surface finish with reduced embrittlement,

reduced tensile residual stress, and/or reduced surface inclusions, cannot readily be defined in purely structural terms.

Furthermore, as noted above and discussed with the Examiners during the interview, the claims now expressly recite that the surface of the saw blade has a reduced residual stress that is imposed by the recited processing steps. As pointed out below and established in the test data, the prior art device described in Vankov does not have reduced residual surface stress. The Electropolishing process does not affect the surface at all. As such, the resulting product disclosed in the Vankov patent has a conventional surface, which would include residual tensile stresses.

The saw blade recited in claims 1 and 13 has reduced surface stresses and actually has compressive residual stresses, as opposed to tensile residual stresses recited in the prior art. As such, the claimed product is clearly distinguishable from the prior art.

Claims 2, 6, 14, and 18 are respectively dependent from claims 1 and 13 and, without prejudice to their individual merits, are believed to be novel and non-obvious over Vankov for the same reasons as claim 1.

Accordingly, based on the foregoing, it is respectfully submitted that claims 1, 2, 6, 13, 14, and 18 are not only new but also non-obvious over Vankov.

35 U.S.C. § 103:

Claims 3 and 15 stand rejected as obvious over Vankov in view of U.S. Patent No. 5,555,788 (Gakhar et al.) Gakhar is cited only as showing a circular saw blade with PTFE-coated anti-kickback portions. Claims 3 and 15 are dependent from claims 1 and 13, and are believed to be novel and non-obvious over the combination of Vankov and Gakhar for the same reasons as claims 1 and 13 are believed to be novel and non-obvious over Vankov alone.

In addition, however, the examiner's reason for the obviousness rejection is that "it would have been obvious ... to provide the device of Vankov et al. with an anti-kickback portion...." It is respectfully pointed out that would not have been obvious, because an anti-kickback portion would not have been useful in Vankov's device. An anti-kickback portion, such as that shown by Gakhar, is applicable only where the tips of the teeth cut outwards in the plane of the blade, to prevent the tips from cutting too deeply. Vankov's device, as noted above,

cuts with a shearing action between the edges 31 and 33 of the blades. There is nowhere on Vankov's blade where an anti-kickback portion could rationally be provided.

The above argument was raised in Applicant's prior response and was not addressed by the Examiner. Thus, the Examiner has failed to establish the motivation for making the combination. Accordingly, it is respectfully submitted that the Examiner has failed to make a proper *prima facie* rejection of these claims since there has been no evidence of a motivation in the art to make the combination of technologies from two distinct fields.

Based on the foregoing, it is submitted that the present invention in claims 3 and 15 is non-obvious over the cited references.

Claims 4, 5, 16, and 17 are rejected as obvious over Vankov alone, on the ground that "where the general conditions of a claim are disclosed in the prior art, discovering the optimum and workable ranges involves only routine skill in the art," citing to *In re Aller*, 105 USPQ 233. The examiner's wording misstates the holding of *In re Aller*. As correctly quoted at MPEP § 2144.05, what it actually says is "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The Court then proceeded to a detailed factual inquiry to determine whether the claimed ranges would have been obvious or not. To establish a *prima facie* case of obviousness, the examiner must show that the claimed ranges would have been discovered "by routine experimentation." This the Examiner has not attempted to do. In fact, Vankov's electropolishing process is being used not only to finish the blades but also to form the cutting edges, and Vankov specifically teaches that a cutting edge sharpness of 10 to 15  $\mu\text{m}$  (0.4 to 0.6 microinches) is too dull (col. 1, line 50), clearly teaching that the ranges of claims 4, 5, 16, and 17 would not have been "optimum or workable" for Vankov's purpose. For this reason also, it is believed that the present invention, as now claimed in claims 4, 5, 16, and 17, would not have been obvious over Vankov.

These points were raised in the response to the prior office action. However the present office action does not address these points at all, instead reissuing the same rejection. It is respectfully submitted that these claims do provide a patentable difference over the prior art and are not a mere matter of design choice. Thus, the rejection of claims 4, 5, 16 and 17 should be reconsidered and withdrawn.

New claim 18 is similar to claim 13 but expressly recites that the saw blade surface includes compressive residual stress. This clearly is distinguishable over the prior art that, as the attached test data shows, includes tensile residual stresses. Tensile residual stresses create a brittle product that is susceptible to cracking and fracturing. The present invention has reduced embrittlement such that the surface tensile residual stresses are replaced with compressive residual stresses. These stresses tend to inhibit cracking as compared to tensile stresses.

Claim 18 also recites that the tips are welded to the teeth, which is clearly not present in the Vankov patent.

Based on the foregoing, it is respectfully submitted that claim 18 is patentable over the prior art of record.

#### **Product-By-Process Claims Are Legally Proper**

The current rejection is improper since, in affect, it establishes that in no situations would process steps recited in a product claim have bearing on the patentability of the resulting claim. This is wrong and contrary to the law. It is well established that "a product-by-process claim, which is a product claim that defines the claimed product in terms of the process by which it is made, is proper." MPEP § 2173.05(p).

The Examiner's rejection explicitly discards the impact that the process steps have on the claimed product. As described in detail in the prior response, the recited process steps result in a structurally different product. As such, there cannot be anticipation since the resulting *products* are different.

It is respectfully submitted that the Examiner has not followed the explicit guidelines set forth in MPEP § 2113 for evaluating a product-by-process claim. As pointed out in the MPEP, an Examiner is correct in issuing a rejection based on §102/103 upon determining that the prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claimed in a product-by-process claim. The burden then shifts to the applicant to show a non-obvious difference that is produced by the recited process steps. MPEP § 2113, second section headline. Hence, the assertion of a §102/103 rejection by the Examiner does not end the inquiry. Upon a showing by the applicant that the process results in a different product, the applicant has overcome the rejection.

As noted in *In re Brown*, the applicant can overcome the rejection §102/103 rejection by showing that the process produces a structurally different product. There are numerous cases that have applied the *In re Brown* test to a claim and have found patentability once the applicant is given a chance to prove that structurally their product is different due to the process steps. The Federal Circuit has repeatedly held that process limitations in product claims must be considered for purposes of determining patentability and validity. See, for example, *Atlantic Thermoplastics Co. Inc. v. Faytex Corp.*, 23 USPQ 2d 1481 (Fed. Cir. 1992). One case of particular interest is *In re Pilkington*, 411 F.2d 1345, 162 USPQ 145, 148-9 (CCPA 1969). In that case a claim to a sheet of glass produced by a float process was allowed over prior art of plate glass, because the float process would result in a better surface finish.<sup>1</sup> *In re Pilkington* is directly on point and is good law. The facts in that case almost explicitly mimic the present case.

Thus, it is clear that, upon a showing that the process steps recited in the present invention produce a structurally different product, the rejection based on only a similar product cannot stand.

#### **The Recited Process Steps Structurally Alter the Claimed Product**

The current claims recite a cutting tool made through application of a specific set of process steps that result in a low friction, low embrittlement product. To prove that the process steps result in a different product, Applicant has had testing conducted on both a saw blade processed in accordance with claim 1 and a saw blade processed using the electropolishing process referred to in U.S. Patent No. 5,802,932 (Vankov et al.), which the Examiner has asserted in his rejection of the claims. Thus, the testing that was performed and described below is to directly compare the products that the Examiner asserts are identical.

In Exhibit A is documentary evidence from Tim Valesquez, who is highly experienced in the art of finishing, and who has particular expertise in electropolishing. Mr. Valasquez is the owner of Union Hard Chromium Co., Inc. As outlined in his report, Mr. Valesquez electropolished two standard saw blades that were provided by Applicant. The process used was a conventional electropolishing process, in line with the process described in Vankov et al. (See,

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<sup>1</sup> *Pilkington* goes on to consider a separate issue, whether the product-by-process form was necessary because the claimed product could not be claimed in purely structural terms. That requirement has since been abolished. See *In re Hughes*, 496 F.2d 1216 (CCPA 1974).



Col. 5, lines 8-10 which state that a conventional electropolishing process was used in Vankov et al.) Thus, saw blades made in accordance with Vankov et al. were used in the testing that is discussed below.

Applicant also made two saw blades using the process recited in claim 1 of the present invention. These saw blades had a surface finish that fall within the recited range set forth in claim 1. Thus, saw blades made in accordance with claim 1 of the present invention were used in the testing that is discussed below.

#### Testing By Saw Smith

One of each of the blades was taken to David Feinberg. Exhibit B includes a report by Mr. Feinberg outlining his background and the testing that was performed. Mr. Feinberg is the owner of Cutter's Edge, a company which is involved in saw blade processing. Mr. Feinberg has over 29 years of experience in the saw blade processing field. As noted in his report, he has inspected and tested various processed blades and is knowledgeable about conventional electropolishing processes, as well as the MIKRONITE finishing process. (The "MIKRONITE finishing process" referred to in Mr. Feinberg's report and this response is the high speed abrasive process recited in the claims and described in the specification of the present application. MIKRONITE is a registered trademark of Mikronite Technologies Group Inc., the assignee of the present application.)

Mr. Feinberg is what is known in the saw blade industry as a "saw smith". That term dates back many decades and refers to individuals that are particularly skilled in the nuances of saw blades and the processing.

Mr. Feinberg conducted several tests of the saw blades for purposes of determining their characteristics, including visually inspecting the effects of both the claimed processing and the electropolishing on the surface of the blades and the carbide tips, and conducting a vibrational test of the blades. Visually, Mr. Feinberg notes that the electropolishing process resulted in etching or deterioration of the carbide tips and, more critically, the bond holding the tips to the plate. Any reduction of the bond between the carbide tips and the blade plate could be disastrous since it could lead to loss of the carbide tips. Not only does that render the saw blade deficient, but the breakage of carbide tips during use can be hazardous.

The vibrational test involved mounting the blades in fixtures and hitting them so as to cause them to resonate at their natural frequency. This test, sometimes referred to as a “ring” test, is informative for two reasons. First, the tone (resonance) of the vibration provides a direct indication of the consistency of the processing. The longer the duration of the vibration (evidenced by the duration of the tone resonating), the more consistent the stress distribution throughout the blade. Second, the different pitch of the resonance indicates a different structural configuration of the saw blade. Much like the tightening of a guitar string changes the stress in the string and thus the resulting tone, the modification of the stresses in the saw blade change the tone that the blade resonates at.

The testing conducted by Mr. Fienberg indicated a distinct vibrational difference between the electropolished saw blade and the saw blade made using the recited process. As noted by Mr. Fienberg, this is clear evidence that the two products are structurally different from one another.

This evidence alone is sufficient to prove that the process steps recited in the claim result in a structurally different product. Thus, this evidence by the Applicant meets the burden set forth in the MPEP and overcomes the rejections set forth in the office action.

#### Testing by American Stress Technologies, Inc.

In order to further substantiate the differences between the products, Applicant contracted with American Stress Technologies, Inc. to conduct an x-ray diffraction test of the products. Exhibit C includes a report issued by American Stress Technologies, Inc. (“AST”)

AST conducted tests on three different saw blades. The first blade was a standard, unfinished saw blade, identical to the blades used to form the electropolished and MIKRONITE processed blades. The first blade provides a baseline for the other test results. The second blade was the electropolished blade. The third blade was the MIKRONITE processed blade, which is the saw blade made in accordance with claim 1 of the present application.

X-ray diffraction measurements were taken in both the circumferential and axial directions. X-ray diffraction is a well known mechanism for determining residual stress in a part. The basic theory is that the refraction angle of an x-ray will vary depending on the residual stress in the component. Using established algorithms and equations, an accurate determination of the residual stress can be provided. See, for example, Prevey, P, “Current Applications of X-



Ray Diffraction Residual Stress Measurement,” Lambda Research, Developments in Materials Characterization Technologies, ASM International, Materials Park, OH, 1996, pp 103-110.

As the test results show in the report, the electropolished saw blade showed essentially no change in the residual stress compared to a unfinished saw blade. The blades both had a slight tensile residual stress. This is in line with the general theory associated with electropolishing. That is, the surface is not mechanically altered. Instead, material is simply removed. Thus, logically, there should not be any significant change to the residual stress in the part. It simply has less material.

The MIKRONITE saw blade, on the other hand, experienced a extremely large drop in residual stress resulting in the generation of compressive residual stress within the part both in the circumferential and axial directions. Compressive residual stresses are beneficial in saw blades since they tend to reduce the development of fatigue cracks and assist in the reduction of vibrations (which result in noise.)

Accordingly, the test results from AST provide further evidence that saw blades made in accordance with claim 1 are different than the blades made in accordance with the Vankov et al. electropolishing process.

This evidence further proves that the process steps recited in the claim result in a structurally different product. Thus, this evidence by the Applicant further overcomes the rejections set forth in the office action.

#### Evidence of Industry Recognition of Structural Differences

While the testing alone that is described above provides sufficient evidence to prove that the product of the claims is structurally different than the prior art, the industry has acknowledged the benefits that the process produces in the saw blade product.

Exhibit D includes a Declaration of Jeffrey Coats, the current President and Chief Executive Office of Mikronite Technologies Group, Inc., the assignee of the present application. As discussed in his Declaration, Mr. Coats describes the testing that DeWalt Power Tools has done related to the saw blade made in accordance with the present invention. DeWalt Power Tools is a world renowned manufacturer of power tool products, including saw blade products. DeWalt has, as part of its decision as to whether to license the technology, conducted extensive testing of saw blades made in accordance with the present invention. The results were such that

not only has DeWalt entered into a license with Mikronite Technologies, but it uses its test results as part of its marketing campaign. Specifically, DeWalt markets the fact that the processed edge will last 20% longer (due to the increased compressive residual stress), will run 35% faster (due to the reduced frictional surface and the increased compressive residual stress), and will stay 20% cooler (due to the reduced frictional surface).

This recognition by DeWalt, a leader in saw blade manufacturing, is direct evidence of industry recognition of the structural (physical) benefits that result in the saw blade made in accordance with the claims.

**Conclusion:**

In view of the foregoing, it is respectfully submitted that the present invention is not only new but also non-obvious over the cited prior art. Reconsideration and withdrawal of the examiner's rejections and an early notice of allowance of all claims are earnestly solicited.

Respectfully submitted,  
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